UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/606,376	06/24/2003	Hui-Kai Chou	JCLA11125	4735

23900 7590 07/26/2007

J C PATENTS, INC.
4 VENTURE, SUITE 250
IRVINE, CA 92618

EXAMINER	
PAYNE, SHARON E	

ART UNIT	PAPER NUMBER
2875	

MAIL DATE	DELIVERY MODE
07/26/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/606,376	CHOU ET AL.	
	Examiner	Art Unit	
	Sharon E. Payne	2875	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 April 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *18-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *18-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☒ Other: *See Continuation Sheet*.

Continuation of Attachment(s) 6). Other: translations of Amano and Ishii.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 18, 19, 22-26 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Amano (JP 04033202 A) in view of Ishii et al. (JP 02157789 A).

Regarding claim 18, Amano discloses a frame having a bottom surface (reference number 1), at least one U-shaped lamp tube disposed in the bottom frame (Figs. 1 and 5) having two electrodes substantially located toward the bottom surface of the frame (Fig. 1). Amano does not disclose the U-shaped lamp tube having two straight portions having the same length.

Ishii et al. discloses a lamp tube having two straight portions having the same length (Fig. 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the configuration of Ishii et al. in the apparatus of Amano to improve the starting performance of the apparatus. See the English abstract of Ishii et al.

Concerning claim 19, Amano discloses a diffusion plate (reference number 15) positioned inside the frame above the U-shaped lamp tube (Figs. 1 and 3).

Regarding claim 22, Amano discloses a frame having a bottom surface (Fig. 1), a least a lamp tube module disposed inside the frame (Fig. 10, the lamp tube module comprising at least

two U-shaped lamp tubes (Fig. 1), and each U-shaped lamp tube having two electrodes substantially located toward the bottom surface of the frame (Fig. 1). Amano does not disclose two straight portions having the same length.

Ishii et al. discloses a lamp tube having two straight portions having the same length (Fig. 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the configuration of Ishii et al. in the apparatus of Amano to improve the starting performance of the apparatus. See the English abstract of Ishii et al.

Concerning claim 23, Amano discloses the U-shaped lamp tubes within each lamp tube module being symmetrically positioned inside the frame (Fig. 1).

Regarding claim 24, Amano discloses the U-shaped lamp tubes within each lamp tube module being alternately positioned inside the frame (Fig. 1).

Concerning claim 25, Amano discloses the lamp tube modules forming an array (Figs. 1 and 5).

Regarding claim 26, Amano discloses the lamp tube modules being laid in a column (Figs. 1 and 5).

Concerning claim 28, Amano discloses the module further comprising a diffusion plate (reference number 15) positioned inside the frame above the lamp tube module (Fig. 1).

3. Claims 20-21, 27 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Amano in view of Ishii et al. as applied to claims 18 and 22 above, and further in view of Kim (U.S. Patent 6,490,015).

Regarding claims 20 and 29, Amano and Ishii et al. do not disclose a plurality of optical plates positioned over the diffusion plate. Kim discloses a plurality of optical plates positioned over the diffusion plate (Fig. 2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the configuration of Kim in the apparatus of Amano and Ishii et al. to produce the desired optical effects for backlighting the LCD. See the abstract and Fig. 2 of Kim.

Concerning claims 21 and 27, Amano and Ishii et al. do not disclose a reflecting plate positioned on the bottom surface of the frame. Kim discloses a reflecting plate (reference number 35, Fig. 2) positioned on the bottom surface of the frame (Fig. 2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the configuration of Kim in the apparatus of Amano and Ishii et al. to produce the desired optical effects for backlighting the LCD. See the abstract and Fig. 2 of Kim.

Response to Arguments

4. Applicant's arguments filed 4/11/07 have been fully considered but they are not persuasive.

Applicant argues that a combination of Amano and Ishii renders Amano unfit for its intended purpose. To the contrary, the modification would leave Amano perfectly fit as a backlight. Making the straight portion have the same length has nothing to do with densely arranging the light sources. Just because Ishii looks like it would not fit well with Amano, please note that the drawings are not to scale, and one cannot infer from them that the combination

would render Amano unfit for its intended purpose. Its ultimate intended purpose is for use as a backlight, and the combination of Ishii and Amano would be fit for that purpose.

Applicant also argues that there is no reasonable expectation of success. To the contrary, the combination would very likely work as a backlight, since making the straight portions of the lamp the same length has nothing to do with densely arranging the lamps. A small radius of curvature can be used with the lamps to arrange them densely as shown in Amano. Making the straight portions the same size is merely a change in size of the apparatus, which would be obvious under MPEP 2144.04 even if Ishii were not combined with Amano.

Regarding claim 22, the Applicant argues that certain elements are not shown in the references, but does not say why they are not shown. It appears that these elements are shown for the reasons disclosed in the rejections.

The arguments regarding the dependent claims stand or fall with the arguments above, which are not accepted for the reasons delineated above.

The requested translations are enclosed for the Applicant's perusal, and this action is non-final as requested by the Applicant.

Conclusion

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sharon E. Payne whose telephone number is (571) 272-2379. The examiner can normally be reached on regular business hours.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sandra O'Shea can be reached on (571) 272-2378. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

7. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Sep

Sharon Payne
Patent Examiner
Technology Center 2800

PTO 07-5631

CC=JP DATE=19920204 KIND=A
PN=0433202

ILLUMINATION DEVICE
[Shoumei souchi]

Mamoru Amano

UNITED STATES PATENT AND TRADEMARK OFFICE
Washington, D.C. July 2007

Translated by: FLS, Inc.

PUBLICATION COUNTRY	(10):	JP
DOCUMENT NUMBER	(11):	S61-163081
DOCUMENT KIND	(12):	A
PUBLICATION DATE	(43):	19920204
APPLICATION NUMBER	(21):	H2-137201
APPLICATION DATE	(22):	19900529
INTERNATIONAL CLASSIFICATION	(51):	F21S 1/00
PRIORITY COUNTRY	(33):	N/A
PRIORITY NUMBER	(31):	N/A
PRIORITY DATE	(32):	N/A

INVENTOR	(72):	AMANO, MAMORU
APPLICANT	(71):	Toshiba Fluorescenting and Technology Corp

TITLE	(54):	Illumination Device
FOREIGN TITLE	[54A]:	Shoumei souchi

Specification /9*

1. Title of the Invention

Illumination Device

2. Claims

A luminous device housing a plurality of low pressure discharge lamps in a casing, releasing to the outside fluorescent emitted from these lamps to the outside through optical diffusive transparent plates established at the opening of the casing wherein at least one of the plurality of low pressure discharge lamps is a curved discharge lamp having a curved part in the middle of the bulb, and placement of the end of other discharge lamps in the space bounded by the curve part of this discharge lamp and linear parts corresponding to those linking to the curved part, and the ends of other discharge lamps curve in the direction of the base of the case, sealing the electrode to the curved end part, introducing this curved end part from the base of the case.

3. Detailed Description of the Invention

(Goal of the Invention)

(Field of the Invention)

This invention pertains to an illumination device which is appropriate for back fluorescents of liquid crystal displays, and to an illumination device which uses a plurality of low pressure discharge lamps as fluorescent sources.

---

* Numbers in the margin indicate pagination in the foreign text.

(Prior Art)

The liquid crystal meter which is used for dashboards in automobiles displays characters and diagrams on the liquid crystal surface focusing fluorescent from the back surface of the liquid crystal, and as a back fluorescent an illumination device is necessary which can shine a uniform brightness with the liquid crystal surface as the entire body having a specified breath.

Hot cathode and cold cathode fluorescent lamps, as fluorescent sources within casings having reflective surfaces on the inner surfaces, as this kind of conventional back fluorescent, are housed, and illumination devise are adopted to emit fluorescent from the lamp from the opening of the casing by reflecting using the reflecting surface.

When using the fluorescent lamp having a hot cathode or cold cathode, the fluorescent lamps having these cathodes, compared to the white heat electric bulb, generates little heat, along with superior fluorescent generating efficiency, with long life, a large fluorescent generating surface area, because of having a long discharge path, and with the advantage of a uniform dispersed fluorescent distribution that is easy to obtain. In addition, when using this kind of fluorescent lamp, the lamp is easy to form as a /10 curve with a discharge path shape, such as U or W-shaped, and for these types of lamps, the advantages include, because the fluorescent

generating surface is planar wide, being able to irradiate uniformly display surfaces having specified widths.

However, the illumination devices which are used most recently as back fluorescents uniformly brighten the entire liquid crystal surface, and furthermore, more and more are required to illuminate with greater brightness. It is thought that, to satisfy more exacting brightness requirements, to house a plurality of fluorescent lamps within a casing and to densely arrange as much as possible these lamps.

For example, if multiple linear shaped fluorescent lamps are mutually connected and arranged in parallel, the arrangement of the generated fluorescent parts becomes dense, the uniformity of the brightness distribution improves, and brightness increases.

However, when multiple fluorescent lamps have a linear tube shape, a construction which connects these electrodes and a power supply, because there are a great number of electrodes, becomes complicated.

In contrast, when using fluorescent lamps that have been curved in a U or W shape, because the generated fluorescent is the same as with fluorescent lamps whose linear part is in the shape of a linear tube, the number of lamps used can be small, that is, the electrode counts becomes small, and the same functions can be maintained as when the lamp arrangement uses multiple fluorescent lamps having linear tubes.

(Problems that the Invention is to Solve)

However, when the fluorescent lamps can be curved, the region bounded by the curve part and by the linear part which is linked to the curve part results in a vacant space. That is, with curve fluorescent lamps, because U and W shapes are formed by processing to curve linear shaped bulbs, by constraining to a curved radius as a result of the process, a boundary develops so that the mutual gaps of the linear parts mutually facing linking the curved parts are made small. Because of this smallness, a space is generated in the region bounded by the curved part and the linear part which is linked to the curve part, and because this part does not generate fluorescent, variations easily develop in the generated fluorescent distribution on the entire surface.

In order to solve this shortcoming, if other fluorescent lamps are inserted and arranged in the region bounded by the curved part of the curved fluorescent lamp and the linear part related to the curve part, because the vacant part is filled, the density of the generating part along the entire body increases, with an increased brightness uniformity.

However, when inserting and arranging the end of other lamps with the vacant space bounded by the curved part as previously described, the electrode which is established at the side end of this insertion do not effectively generate fluorescent, and a non-

generating fluorescent or low generating fluorescent part occurs in the vacant space bounded by the curved part.

In addition, an electrode is placed at the end of the lamp, and this electrode connects with stable equipment on the power source side through an wire cord, but in this instance, when inserting the end of other lamps in the vacant space bounded by the curved part of one curved lamp, a process for the wire cord connected with the electrode established on this insertion side's end becomes troublesome. That is, concern arises for the wire cord which is connected to the electrode, as fluorescent is discharged from the lamp, and in addition if the wire cord is wound around the end of the bulb, because the space narrows, operability suffers, and because maintenance of the space in which the wire cord is wound becomes a non-generating fluorescent part, a defect occurs with worsening of the brightness or fluorescent dispersion distribution, and in addition, construction of a process to draw the wire cord becomes complicated.

This invention, aware of these facts, obtains a uniform brightness along with an improved brightness which can densely arrange generating fluorescent parts, and provides an illumination device whose process for wire cord connecting electrodes is simple.

(Formation of the Invention)

(Means for Solving the Problems)

This invention is a luminous device housing a plurality of low pressure discharge lamps in a casing, releasing to the outside fluorescent emitted from these lamps to the outside through optical diffusive transparent plates established at the opening of the casing wherein at least one of the plurality of low pressure discharge lamps is a curved discharge lamp having a curved part in the middle of the bulb, and placement of the end of other discharge lamps in the space bounded by the curve part of this discharge lamp and linear parts corresponding to those linking to the curved part, and the ends of other discharge lamps curve in the direction of the base of the case, sealing the electrode to the curved end part, introducing this curved end part from the base of the case.

(Use)

According to this invention, because of the end parts of the other fluorescent lamps are arranged in the vacant region which is bounded by the curved part and the linear part that is linked to the curved part for a fluorescent lamp having a curved form, this vacant space is filled with fluorescent generating parts. In this case, the end of other discharge lamps which are arranged in this vacant /11 space curve in the base direction of the casing, and because the electrodes are sealed at this curved end, the vacant space has no lamp ends characterized by non-generating fluorescent parts or low

generating fluorescent parts, and along with an improvement in brightness from the dense arrangement of the generating parts on the entire surface, brightness uniformity increases. In addition, connection or drawing of the wire cord, because this curved end is led out from the base surface of the casing, can be made at the casing's rear surface.

(Embodiments)

An explanation is given for one embodiment shown in Figs. 1-3 for this invention.

In the figures, 1 denotes the casing, formed as a thin plate shape from synthetic resin such as polycarbonate or metal alloy. The inner surface of this casing 1 has a reflecting surface 2 along the entire surface.

A plurality of cold cathode fluorescent lamps 3a, 3b, 3c, and 3d are housed in this kind of casing 1.

In the case of this embodiment, U shaped lamps are respectively used for these cold cathode fluorescent lamps 3a, 3b, 3c, and 3d.

Each of these lamps 3a, 3b, 3c, and 3d has a bulb 4 which has a curved form in the shape of a U. Thus, the bulb 4 comprises a U-shaped curved part 5 and linear parts 6a and 6b which are established approximately mutually parallel with both ends of the curved part 5. These linear parts 6a and 6b are made to have different lengths, and curved end parts 7a and 7b, curved at approximately right angles with respect to the level surface through the curved part 5 and the linear

parts 6a and 6b, are formed. Cold cathode electrodes 8a and 8b are sealed to these curved end parts 7a and 7b.

Moreover, fluorescent coating (not illustrated) is formed on the inner surface of the bulb 4, and in addition, on the inside of the bulb 4, substances used for start-up such as specified amounts of mercury and dilute gases such as argon and xenon are sealed. Each of the 4 U-shaped cold cathode fluorescent lamps 3a, 3b, 3c, and 3d which are formed as described above, are established in parallel horizontally, and the pairs 3a and 3b with 3c and 3d of the U-shaped cold cathode fluorescent lamps are arranged differently.

Furthermore, more specifically, a vacant space 9 is formed in a region bounded respectively by the U-shaped curved part 5 and the linear parts 6a and 6b which are linked to the curved part 5 for each of the 4 U-shaped cold cathode fluorescent lamps 3a, 3b, 3c, and 3d. Each of the 2 U-shaped cold cathode fluorescent lamps 3a and 3b together with 3c and 3d are arranged so that one of the linear parts of other lamps is slotted in the vacant space 9 of the other respective lamps. Thus, with the example of 2 U-shaped cold cathode fluorescent lamps 3a and 3b, the linear part 6b and 6b in the short direction of other lamps is inserted in the vacant space 9 and 9 of the respective lamps.

Because of this arrangement, every linear part 6a… , 6b… , of the4 U-shaped cold cathode fluorescent lamps is arranged so as to be

approximately mutually parallel, and is arranged connected to one another.

Each of this kind of lamp is housed in the casing 1, the curved end parts 7a and 7b are oriented in the direction of the base surface of the casing 1, and introduced from the conduction out hole 10 formed on the base wall.

The lead line 11… connected to the electrode extends from this conduction out end, and the wire cord 12 outside of the base surface of the casing 1 is connected to these lead lines 11…. The wire cords 12 are connected to the non-illustrated power supply side fixed equipment.

The light dispersion transparent plate 15 is mounted on the upper surface opening of the casing 1. This light dispersion transparent plate 15 is used for light dispersion with a whole of white color such as an acryl resin.

The operation of this kind of construction will be explained.

When each U-shaped cold cathode fluorescent lamp 3a, 3b, 3c, and 3d are lit, after the light which is emitted from this lamp 3a, 3b, 3c, and 3d is reflected by the direct connection and reflection surface 2 of the casing 1, the light goes in the direction of the opening of the casing 1 and shines to the outside through the transparency of the light dispersion transparent plate 15 which is established at this opening.

In this case, because in this embodiment the 4 U-shaped cold cathode fluorescent lamps 3a, 3b, 3c, and 3b are arranged differently and because each of the linear parts 6a and 6b of each of the lamps /12 is parallel to one another, and because no gaps exist, the distributed light distribution is good.

Furthermore, because for the U-shaped cold cathode fluorescent lamps 3a, 3b, 3c, and 3d, the adjacent lamp linear part 7b... advances and is arranged at the vacant space which is bounded by the respective U-shaped curved part and the linear parts 6a and 6b which are linked to the curved part 5, the generating light part exists along in the vacant space 9. Furthermore, the region in which the electrodes 8a and 8b of the lamp end part are curved in the direction of the base surface of the casing 1, the generating light part which is inserted and arranged in the vacant space 9 connects with the curved part 5 which surrounds the vacant space 9, and it is possible to reduce the gaps generated between the vacant space 9 and the curved part 5.

Consequently, non-generating light parts or low generating light parts do not exist in the vacant space 9, and the casing 1 is filled with generating light parts on the entire surface. Because of this arrangement, the casing becomes close to the level surface light source, and along with an improvement in brightness, illumination distribution becomes uniform.

Accordingly, the light dispersion transparent plate 19 is bright along the entire surface and degree of brightness irregularities is eliminated. In addition, because it is possible to connect and arrange the lamps, it is possible to make the casing 1 small.

Because the curved part 7a and 7b of each lamp conducts out from the base surface of the casing 1, it is possible to connect the wire cord 12 to this conduction out end, and operability is good because of the drawing of the wire cord 12 on the rear surface of the casing 1, and in addition, no worry exists for the wire cord interrupting the light.

Moreover, this invention is not limited by this embodiment.

That is, an explanation was given, using the embodiment for an illumination device which uses 4 U-shaped cold cathode fluorescent lamps, and the lamps used are not limited to the embodiment.

For example, Fig. 4 shows Embodiment 2 of this invention, and for this case, a single U-shaped cold cathode fluorescent lamp 20 and a single linear cold cathode fluorescent lamp 21 are used. In this case, one end of the linear cold cathode fluorescent lamp 21 is inserted and arranged in the vacant space 9 which is bounded by the U-shaped curved part 5 of the U-shaped cold cathode fluorescent lamp 20 and the linear parts 6a and 6b which link to the curve part, and he ends are curved in the base direction of the casing 1.

Both ends of the U-shaped cold cathode fluorescent lamp 20 and one end of the linear cold cathode fluorescent lamp 21, without a curved end, are led to the side of the casing 1.

Even with this arrangement, an increase in arrangement density of the generating light parts is attained.

In addition, Fig. 5 shows Embodiment 3 of this invention as an example with one W-shaped cold cathode fluorescent lamp 30, 2 U-shaped cold cathode fluorescent lamps 31a and 31b, and 1 linear cold cathode fluorescent lamp 32.

Furthermore, this invention does not limit the cold cathode fluorescent lamps and hot cathode fluorescent lamps may be used.

In addition, this invention may also, without limiting fluorescent lamps, have dilute gas discharging lamps.

In addition, the illumination device of this invention is not limited to being used for a back light of liquid crystal display devices.

(Effect of the Invention)

According to this invention as explained above, because the end of other fluorescent lamps are arranged in a vacant space region bounded by a curved part at a curved fluorescent lamp and the linear part which is linked to it, this vacant space is filled by generating light parts. In this case, the end of other discharge lamps which are arranged in this vacant space curves in the base surface direction of the casing, and because the electrode is sealed to this curved end

part, the end resulting from the non-generating light part or the low generating light part does not exist in the vacant space, and because generating light parts are densely arranged along the entire surface, in addition to an increase in brightness, the average degree of brightness is increased. In addition, because of drawing of curved part of the lamp from the base surface of the casing, the connection or drawing of the wire cord is performed by the back surface of the casing, and along with an improvement in operability, no defects exists such as the wire cord cutting off the light.

Brief Explanation of the Drawings

Figs. 1 through Fig. 3 show Embodiment 1 of this invention, with Fig. 1 a perspective diagram which decomposes the entire illumination device, Fig. 2 is a level surface view which shows the lamp arrangement, Fig. 3 is a cross-sectional diagram along the III-III line of Fig. 2, Fig. 4 is a level diagram of the lamp arrangement /13 which shows Embodiment 2 of this invention, and Fig. 5 is a level diagram of the lamp arrangement showing Embodiment 3 of this invention.

1 - casing; 2 - reflection surface, 3a, 3b, 3c, and 3d - U shaped cold cathode fluorescent lamps; 4 - bulb; 5 - curved part; 6a, 6b - linear part; 7a,7b - curved end part; 8a, 8b - cold cathode; 10 - conduction out hole; 12 - wire cord; 20 - U-shaped cold cathode fluorescent lamp; 21 - linear cold cathode fluorescent lamp; 30 - W-shaped cold cathode fluorescent lamp; 31a, 31b - U-shaped cold

cathode fluorescent lamp; 32 - linear tube cold cathode fluorescent lamp.

Figure 1

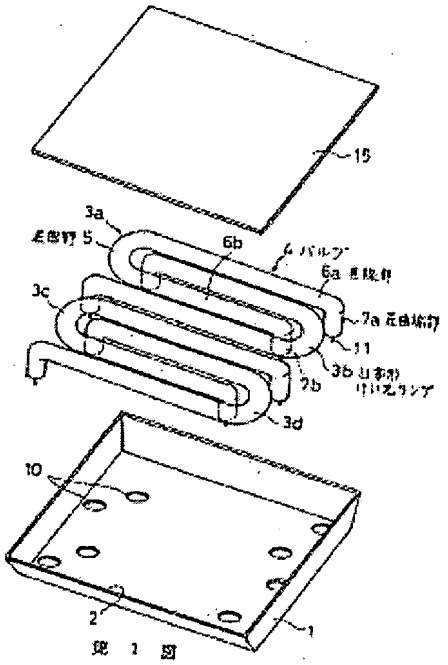


Figure 2

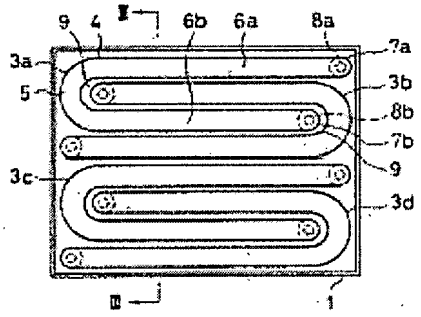


Figure 3

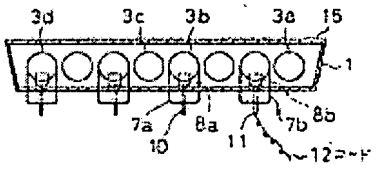


Figure 4

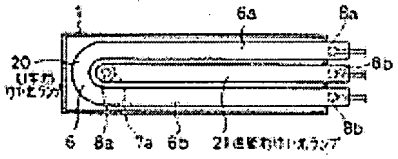
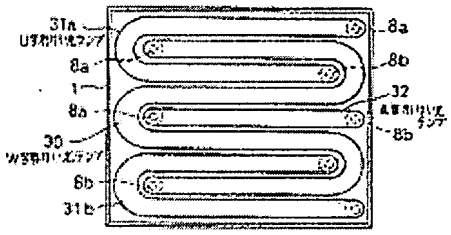


Figure 5



PTO 07-5632

CC=JP DATE=19900618 KIND=A
PN=02157789

BACK LIGHT DEVICE
[Bakku Raito Souchi]

Takashi Ishii, et al.

UNITED STATES PATENT AND TRADEMARK OFFICE
Washington, D.C. July 2007

Translated by: FLS, Inc.

PUBLICATION COUNTRY	(19):	JP
DOCUMENT NUMBER	(11):	02-157789
DOCUMENT KIND	(12):	A
PUBLICATION DATE	(43):	19900618
APPLICATION NUMBER	(21):	63-311481
DATE OF FILING	(22):	19881209
ADDITION TO	(61):	
INTERNATIONAL CLASSIFICATION	(51):	G 09 F 9/00; G 02 F 1/1335; H 04 N 5/66
PRIORITY	(30):	
INVENTORS	(72):	ISHII, TAKASHI; KOKUBUN, YASUO; KOIWAI, HIDEAKI
APPLICANT:	(71):	TOSHIBA CORPORATION
DESIGNATED CONTRACTING STATES	(81):	
TITLE	(54):	BACK LIGHT DEVICE
FOREIGN TITLE	[54A]:	BAKKU RAITO SOUCHI

SPECIFICATION /805*

1. Title

Back light device

2. Claims

A back light device, characterized by being equipped with a reflective plate formed from a metallic material with high heat conductivity; a holder formed from an insulating material with high heat conductivity affixed to this reflective plate; a lamp attached to aforementioned reflective plate affixed by means of aforementioned holder; a spacer formed from an insulating material with high heat conductivity installed in the space between this lamp and aforementioned reflective plate to perform heat dissipation or heating of aforementioned lamp; and a heater that is equipped on the inside of this spacer.

3. Detailed explanation of invention

[Objective of invention]

(Industrial field of utilization)

This invention pertains to a back light device which is used, for example, in a liquid crystal display device.

(Prior technology)

Because liquid crystal display devices (LCD) can be constructed in small, thin forms compared to prior color picture tubes (CRT), they are used as displays in various fields. Because a luminous

* Numbers in the margin indicate pagination in the foreign text.

source is needed in the above explained liquid crystal display devices, there are types that use, for example, natural light, or there are types that use a back light.

There are the following kind of back lights used in the above explained liquid crystal display devices.

Figure 5 is a diagonal overview showing a prior back light device.

In the same figure, 1, 1 shows opposing trapezoid shaped support plates. In the space between support plates 1, 1, a reflective plate 2 made of polycarbonate is installed and held in place by support plates 1, 1. A holder 3 formed from silicone rubber is attached to each of the support plates 1, 1. Lamp mounting holes 3a, 3a are formed on one of the holders 3, and the electrode side of U shaped lamp 4 is attached by inserting in the lamp mounting holes 3a.

Then a back light device formed in this manner is utilized by /806
installing it on the back surface of a liquid crystal panel.

In the above explained back light device, a small size, high brightness type of lamp is used, and whiteness is obtained. For example, there are many lamps that are used in portable liquid crystal display devices that are below brightness of 10000nt, and, because of the narrow utilization temperature range of brightness, there are times when the heat generation of a lamp adversely affects the small liquid crystal display portion. Also, for example in a liquid crystal display device for automotive use, a device under a

high temperature, for example 65°C, is used, also, in order for a lamp to obtain a specified brightness, those exceeding brightness 10000nt are used. Because of this, there is large lamp heat generation and the heat has a large effect on the liquid crystal panel surface adversely affecting the operation of the liquid crystal element.

Also, in a case where it is possible to use a low temperature liquid crystal display device, for example 20°C, generally, lamp initiating electric current is increased, so a construction is done where a heater is installed to heat the lamp, and vapor pressure of mercury inside the lamp is increased in order to illuminate the lamp.

In this way, in a case of attaching a heater to a lamp, as shown in Figure 6, a [illegible] heater 5 is installed on the bottom of lamp 4, done by holding them by means of a transparent tube 6.

In this case, however, because the surface area transparency ratio of transparent tube 6 wrapped around lamp 4 depends on the [illegible] heater 5, there is the issue that the overall brightness is decreased with the decrease in reflected light.

(Issues the Invention Proposes to Solve)

As explained above, in previous back light devices, heat dissipation efficiency corresponding to heat generation of a lamp is low, and because of this, there is an issue of decreasing operational characteristics of a liquid crystal element, and, in a case of

attaching a heater to a lamp, there is an issue of decreasing brightness of a back light device.

In order to solve the above explained prior issues, there is the objective of providing a back light device where it is possible to satisfactorily dissipate heat of generated heat inside a device, and it is also possible to increase brightness and start up characteristics at low temperatures.

[Invention Construction]

(Methods to Solve the Issues)

This invention is equipped with a reflective plate formed from a metallic material with high heat conductivity, and a holder formed from an insulating material with high heat conductivity affixed to this reflective plate, and a lamp attached to aforementioned reflective plate affixed by means of aforementioned holder, and a spacer formed from an insulating material with high heat conductivity installed in the space between this lamp and aforementioned reflective plate to perform heat dissipation or heating of aforementioned lamp, and a heater that is equipped on the inside of this spacer.

(Operation)

With this invention, because a reflective plate is formed from a metallic material with high heat conductivity, together with a lamp support holder and spacer constructed from an insulating material with high heat conductivity, and because there is a heater inside the

spacer, it is possible to satisfactorily dissipate heat of generated heat inside a device, and it is also possible to increase brightness and start up characteristics at low temperatures.

(Implementation Example)

Below, an implementation example of the invention is explained using the figures.

Figure 1 is a diagonal view showing a back light device of this invention, Figure 2 is a cross section diagram of Figure 1. In these figures, 11 is a reflective plate formed in a tray shape from a metal, for example aluminum or such, with high heat conductivity. On top of reflective plate 11, a holder 12 is formed from an insulating material with high heat conductivity, such as silicone rubber or such, and on top of each holder, a mounting plate 13 is installed. A screw 14 is then passed through mounting plate 13, and by screw 14 connecting to reflective plate 11 each holder 12, 12 is affixed. Also, on each holder 12, each of electrode retention holes 15, 15 are formed, and in electrode retention holes 15 each electrode of a U shaped lamp 16 is inserted and thereby lamp 16 is supported at a designated distance from reflective plate 11. Also, in the space between lamp 16 and reflective plate 11, a U shaped spacer 17 formed from an insulating material with high heat conductivity, for example silicone rubber and such, is installed. In the space between spacer 17 and reflective plate 11, as shown in Figure 2, a laminate heater /807

18 is installed. Also, on the bottom portion of the U shape of lamp 16 on reflective plate 11 is a transparent lamp mounting band 19, and the U shaped portion of lamp 16 is mounted by this band 19.

As shown in Figure 3, above explained spacer 17 is formed in a U shape, and is formed with a concave groove 17 to closely adhere to lamp 16.

Lamp 16, because of this, in addition to being mounted to closely adhere to electrode holders 12, 12, the luminous portion of lamp 16 is held closely adhering to spacer 17, and by the fact that spacer 17 and holder 12 are mounted closely adhering to reflective plate 11, reflective plate 11 dissipates heat of heat generated by lamp 16 through each of the above explained sections.

Also, during low temperatures at the time of initiating lighting of lamp 16, heater 18 of spacer 17 begins to heat up. Because of this, heat generation of heater 18 is conveyed to lamp 16 through spacer 17 and satisfactory illumination at the time of low temperature is accomplished.

Next, a usage example of a back light device constructed in this manner is explained using Figure 4.

In the same figure, 21 is a back light device with above explained structure, 22 is a cabinet, 23 is an upper cover made of metal, 24 is a mounting arm made of metal connected to upper cover 23, and 25 is a back cover of cabinet 22.

On both sides of a reflective plate 11 of back light device 21, mounting brackets 26, 26 made of metal are formed, and mounting brackets 26, 26 are attached to above explained mounting arm 24.

Because of this, generated heat of back light device 21 is satisfactorily dissipated by conveying from reflective plate 11 to upper cover 23 through mounting brackets 26 and mounting arm 24.

(Effects of Invention)

As explained above a back light device of this invention, formed from a metal material with high heat conductivity together with a lamp support holder and a spacer being formed from an insulating material with high heat conductivity, and because it also has installed a heater inside the spacer, it is possible to have satisfactory heat dissipation of heat generated inside the device, and furthermore increase brightness at times of low temperature.

4. Simple Explanation of the Figures

Figure 1 is a diagonal view showing a back light device of one implementation example of this invention, Figure 2 is a cross section diagram of Figure 1, Figure 3 is a diagonal view showing the spacer of Figure 1 and Figure 2, Figure 4 is a diagonal view showing a usage example of a back light device of Figure 1, Figure 5 is a diagonal view showing a prior back light device, and Figure 6 is a diagonal view of a lamp of Figure 5.

11 - Reflective plate; 12 - Holder; 16 - Lamp; 17 - Spacer; 18 - Heater.

Figure 1

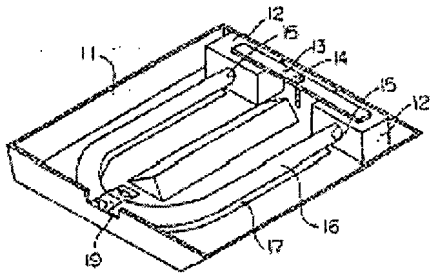


Figure 2

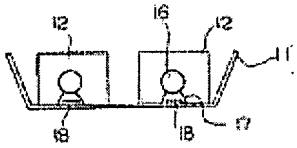


Figure 3

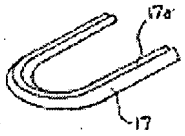


Figure 4 /808

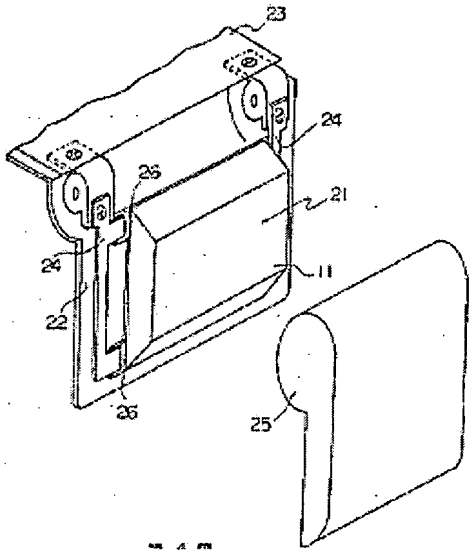


Figure 5

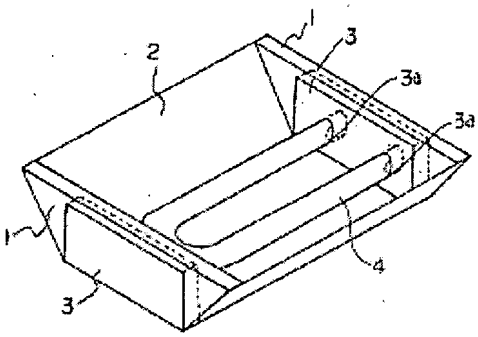


Figure 6